

## **CLAIMS**

What is claimed is:

1. A method comprising:
  - depositing a film layer on a substrate;
  - depositing a photoresist layer upon the film layer, the photoresist having a developer-soluble resin component and a photoactive compound component, the photoactive compound inhibiting the solubility of the developer-soluble resin;
  - exposing selected portions of the photoresist layer to a light source such that a solubility of the selected portions of the photoresist layer is promoted; and
  - developing the exposed portions of the photoresist layer.
2. The method of claim 1 wherein the developer-soluble resin is a polyhydroxystyrene-based compound.
3. The method of claim 2 wherein the solubility of the selected portions of the photoresist layer is promoted by the photoactive compound forming an acid.
4. The method of claim 2 wherein the photoactive compound contains a phenyl group.
5. The method of claim 3 wherein the acid is a carbonyl acid.

6. The method of claim 1 wherein the developer-soluble resin is produced through a free radical polymerization process using a component selected from the group consisting of vinyl acid, vinyl phenol, and vinyl phenol substitutes.

7. The method of claim 1 wherein the light source has a wavelength in the extreme ultraviolet region.

8. The method of claim 7 further comprising:

etching portions of the film layer underlying the exposed portions of the photoresist layer; and

etching a remaining portion of the photoresist layer to produce a patterned film layer having one or more features, at least one of the features having a critical dimension of approximately 15 nanometers.

9. The method of claim 8 wherein the at least one feature has a line wide roughness of less than 2 nanometers.

10. A photoresist comprising:

a resin component, the resin soluble in a developer; and  
a photoactive compound, the photoactive compound uniformly distributed within the photoresist, the photoactive compound promoting solubility of a selected portion of the photoresist exposed to a light source and inhibiting the solubility of an unexposed portion of the photoresist.

11. The photoresist of claim 10 wherein the resin component is a polyhydroxystyrene-based compound.
12. The photoresist of claim 11 wherein the solubility of the selected portion of the photoresist is promoted by the photoactive compound forming an acid.
13. The photoresist of claim 12 wherein the photoactive compound contains a phenyl group.
14. The photoresist of claim 12 wherein the acid is a carbonyl acid.
15. The photoresist of claim 10 wherein the resin component is produced through a free radical polymerization process using a component selected from the group consisting of vinyl acid, vinyl phenol, and vinyl phenol substitutes.
16. An apparatus comprising:
  - a substrate;
  - a feature layer disposed upon the substrate, the feature layer having formed thereon one or more features, the one or more features having a line wide roughness of less than 2 nanometers.
17. The apparatus of claim 16 wherein at least one of the one or more features has a critical dimension in the range of 10 – 20 nanometers.

18. The apparatus of claim 16 wherein the film layer is a metal film layer.
19. The apparatus of claim 17 wherein the line wide roughness of a particular feature is no more than 10% of the critical dimension of the particular feature.
20. The apparatus of claim 16 wherein the substrate and feature layer are components of a microprocessor integrated circuit device.